Rejection by Implicature
Author(s): Marilyn A. Walker
Proceedings of the Twentieth Annual Meeting of the Berkeley Linguistics Society: General Session Dedicated to the Contributions of Charles J. Fillmore (1994), pp. 563-574

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Marilyn A. Walker
Mitsubishi Electric Research Labs

1 Introduction

On one view of dialogue, the conversational record is part of the COMMON GROUND of the conversants. As conversants make assertions, the content of these assertions are added to the common ground, with the effect of limiting the context set (Stalnaker, 1978; Gazdar, 1979). According to Stalnaker, an assertion is assumed to be ACCEPTED, with a concomitant limitation of shared context, unless it is REJECTED by another conversant, and if an assertion is REJECTED the context remains as it was.

Although Stalnaker says nothing about how acceptance and rejection are indicated and recognized in dialogue, other work has shown that the inference of acceptance **can** be licensed in the absence of rejection (Whittaker and Stenton, 1988; Walker and Whittaker, 1990), but that conversants often explicitly indicate acceptance, as B does in 1:

(1) A: Sue's house is on Chestnut St.

B: Chestnut St.

The examples to follow are like 1: speaker A asserts U_1 and speaker B asserts U_2. If B's utterance indicates that B accepts A's assertion, we say that U_2 ACCEPTS U_1. If B's utterance indicates that B rejects A's assertion, we say that U_2 REJECTS U_1.

Indicators of acceptance range from the IMPLICIT ACCEPTANCE displayed by simply going on to the next topic, to phrases such as *uh huh* and *okay*, to partial repetitions such as 1B, to paraphrases or making inferences explicit (Clark and Schaefer, 1989; Walker, 1992). Walker (1992) argues that the the explicitness of acceptance affects the defeasibility of the propositions in the common ground.

Previous work has also identified three types of rejection: (a) DENIAL as in 2; (b) LOGICAL CONTRADICTION as in 3; and (c) IMPLICIT DENIAL as in 4, where B denies a presupposition of A's (Horn, 1989), p. 182-184.

(2) A: Pigs can fly.

B: No, you idiot, pigs can't fly! (Horn's 29)

(3) A: Kim and Lee have been partners since 1989.

B: But Lee said they met in 1990.

(4) A: Julia's daughter is a genius.

B: Julia doesn't have any children.

It seems to have been commonly assumed that the types of denial and contradiction exhaust the ways in which rejection can be indicated (Gazdar, 1979; Allwood, 1992), yet neither logical inconsistency nor denial of a presupposition is **necessary** for rejection as in 5:

(5) A: There's a man in the garage.

B: There's something in the garage.

The proposition realized by 5B follows from 5A as an entailment via existential generalization, yet 5B REJECTS 5A. That the informationally weaker 5B can reject 5A is surprising. How can a logically consistent assertion function to reject another assertion?

I will argue that the basis for the rejection function of 5B is a QUANTITY implicature (Grice, 1975; Horn, 1972; Gazdar, 1979; Hirschberg, 1985). Furthermore, the implicature depends on the FOCUS/OPEN PROPOSITION structure of U_1 and U_2 (Prince, 1981; Prince, 1986), also known as the focus/p-skeleton of an utterance (Rooth, 1985). The analysis raises several issues which will then be discussed in sections 3 through 5.

2 Rejection by Implicature

Quantity implicatures arise from the use of a less informative item in a sentence, implicating that the same sentence with a more informative item is either false or unknown. Thus the less informative *some* in 6 gives rise to the implicature in 7:

(6) Kim ate some of the cookies.

(7) Kim didn't eat all of the cookies.

Scalar implicatures are a type of quantity implicature (Horn, 1972). Hirschberg's theory of scalar implicature specifies the conditions under which a speaker may LICENSE a scalar implicature and that a hearer must have access to in order to INFER that a speaker intended a particular scalar implicature (Hirschberg, 1985). Scalar implicatures are calculated from surface semantic representations of propositions, i.e. from logical form, by identifying a potentially scalar subformula in the logical form, identifying the scale or scales that this subformula belongs to, and generating implicatures for alternate and higher values of that scale.

The theory depends on (1) $\mathcal{O}$, a salient ORDERING or scale, defined as any partially ordered set, POSET, relation over a set of scalar expressions $e_1 \ldots e_n$; (2) a means of ranking sentences as HIGHER, LOWER or ALTERNATE sentences with respect to $\mathcal{O}$; and (3) a specification of whether the speaker uttered a sentence which AFFIRMED, DENIED or declared IGNORANCE of a value on $\mathcal{O}$.

A means of ranking sentences is provided by the definition of a scale as a POSET, e.g. a HIGHER sentence is a sentence with a higher value from the POSET. The expressions e_i which can participate in scales are any constant, predicate, logical or epistemic operator, connective or quantifier symbol of a proposition p_i or any wff that is a subformula of p_i. Here we consider sentences that AFFIRM a value e_i on a scale $\mathcal{O}$ in an asserted proposition p_i, as defined in 8. A sentence p_i is SIMPLE with respect to an occurrence of a component expression e_i iff p_i contains no instances of negation with wider scope than e_i.

(8) AFFIRM(S, e_i, p_i) iff (p_i = BEL(S, p_j)$\wedge$ SIMPLE(p_j, e_i))

The SCALAR IMPLICATURE INFERENCE RULE (SIIR) for AFFIRMED sentences is in 9, where $\mathcal{O}$ is an ordering, C_h is the context, and BMB is the standard Belief in alternating mutual belief:

(9) SCALAR IMPLICATURE INFERENCE RULE(SIIR):
$\exists \mathcal{O}(BMB(Salient(\mathcal{O}, C_h) \wedge Realize(u_i, Affirm(S, e_i, Bel(S, p_i))$
$\wedge (HigherSent(p_i, p_j, \mathcal{O}) \vee AltSent(p_i, p_j, O)))$
$\rightarrow ScalarImp(S, H, u_i, \neg BEL(S, p_j), C_h)))$

The SIIR says that if there is a scale $\mathcal{O}$ that is salient in the context and a speaker S affirms a sentence p_i with a component expression e_i, and there is another sentence p_j which is a higher sentence or alternate sentence to p_i with respect to scale $\mathcal{O}$, then the speaker may implicate that it's not the case that s/he believes p_j, i.e. either s/he doesn't know whether p_j or she believes not p_j.

Thus if we instantiate the SIIR by letting u_i be the assertion in 6, the scale $\mathcal{O}$ be the scale of quantifiers (*some, all*), the higher sentence p_j be 10, and the context C_h the null context, we get the implicature in 11, glossed in 7.

(10) Kim ate all of the cookies.

(11) ScalarImp(S, H, *Kim ate some of the cookies*,
¬ BEL(S, *Kim ate all of the cookies*), C_h)))

The predicate ScalarImp in 11 is defined so that implicatures can be felicitously CANCELLED, as in 12a, as well as REINFORCED as in 12b.

(12) a. Kim ate some of the cookies, and in fact Kim ate all of them.

b. Kim ate some of the cookies, but Kim didn't eat all of them.

The tests of CANCELLABILITY and REINFORCEABILITY distinguish conversational implicatures from entailments (Grice, 1975; Horn, 1972; Sadock, 1978; Horn, 1991). In 12b, the implicature was cancelled by a subsequent statement, but can also be cancelled by **prior** context, so that the implicature never arises, as in 13.

(13) Kim may have eaten all of the cookies. She ate some of them.

Thus in every respect, scalar implicatures are DEFAULT inferences (Joshi et al., 1986; Perrault, 1990).

Now, consider the quantity implicature in 15, which arises from 14:

(14) A: Is the new student brilliant and imaginative?

B: He's imaginative.

(15) He's not brilliant.

In 14, A introduces a question as to whether a, *the new student*, is both $brilliant$ and $imaginative$. The conjunction evokes the scale of conjunctive assertions ($P, P \wedge Q$), where P is *The new student is imaginative* and Q is *The new student is brilliant*, and $P \wedge Q$ is a higher sentence than P. Thus because speaker B affirms P with 14B, B implicates the denial of $brilliant(a)$ in 15.

However, note that the implicature in 15 still arises in the context of the assertion in 16A:

(16) A: The new student is brilliant and imaginative.

B: He's imaginative.

Thus the implicature is not dependent on the question context of 14, and 16B rejects 16A. Similarly, the SIIR licenses the inference of rejection in 5. The salient scale $\mathcal{O}$ must include (*a man, something*) and 5A is a higher sentence than 5B. Then B's assertion implicates that it isn't the case that B believes 5A.

2.1 Issues

The analysis of rejections as implicature presented above partially explains how a logically consistent (entailed) proposition, asserted by a speaker B after an assertion by a speaker A can function to REJECT A's assertion. However, the analysis raises several issues.

First, a less informative U_2 following an assertion U_1 may ACCEPT U_1 rather than REJECT it, as in 1B. Section 3 discusses the difference between acceptance and rejection.

Second, implicatures only arise when they are consistent with the context, as 13 shows. However 15 is not consistent with 16A. Section 5 presents a theory which explains why a rejection implicature can arise in a context with which it is inconsistent.

The third issue is how the speaker and hearer coordinate on the SALIENT scale that licenses a scalar implicature. Because a single sentence can potentially evoke many scales, the assertion in 1 repeated here as 17a can license any of the implicatures in 17b to 17d:

(17) a. Sue's house is on Chestnut St.

b. The speaker doesn't believe that Steve's house is on Chestnut St.

c. The speaker doesn't believe that Sue's car is on Chestnut St.

d. The speaker doesn't believe that Sue's house is on Walnut St.

The determinant is whether the salient scale $\mathcal{O}_i$ is (Steve, Sue) for 17b, (house,car) for 17c or (Chestnut St., Walnut St.) for 17d. Section 3 discusses how the FOCUS/OPEN PROPOSITION information structure of these utterances provide the cues for determining the salient scale.

Fourth, when a rejection is logically consistent, as in 5, it is perfectly possible that both assertions hold, and that both a man and something else are in the garage. Some cues to distinguish rejection from simple continuation are discussed in section 4.

Finally, rejections are often realized with Fall-Rise intonation, which may signal disagreement (Ladd, 1980). The role of Fall-Rise is discussed in section 4.

3 Acceptance and Rejection

The logically entailed rejections discussed above are a type of INFORMATIONALLY REDUNDANT UTTERANCE, IRU, as defined in 18 (Walker, 1993a):

(18) An utterance u_i is INFORMATIONALLY REDUNDANT in a discourse situation $\mathcal{S}$ if u_i expresses a proposition p_i, and another utterance u_j that entails, presupposes, or implicates p_i has already been said in $\mathcal{S}$.

IRUs can also be used to indicate explicit acceptance, e.g. 1B, which does **not** implicate that for all B knows it is not **Sue's** house that is on Chestnut St. Yet, it is plausible that the logical form for 1 includes conjunction as in 19, and thus could evoke the scale of conjunctive assertions:

(19) (house x) ((belong-to Sue x) $\wedge$ (located x Chestnut St.))

One hypothesis for the lack of an implicature in 1B is that A's utterance in 1A has no explicit conjunction, and that an explicit conjunction is required to introduce the scale of conjunctive assertions. However, the implicature conveyed by 20B, glossed in 21a, and given in 21b, can be explained most naturally by postulating a conjunctive representation at the propositional level as in 22:

(20) A: We bought these pajamas in New Orleans for me.

B: We bought these pajamas in New Orleans.

(21) a. But not for you.

b. ScalarImp(B, A, *We bought these pajamas in New Orleans*, $\neg$ BEL(B, *We bought these pajamas in New Orleans for you.*), C_h)))

(22) (pajamas x) ((bought e x) $\wedge$ (located e New Orleans) $\wedge$ (agent e WE) $\wedge$ (benefactor e ME))

Thus the implicature in 21B, which indicates rejection, is generated **without** explicit conjunction. So what is the difference between 1B and 20B?

One clue is provided by an examination of 54 partial repetitions that indicate acceptance from a corpus of naturally-occurring problem solving dialogues (Walker, 1993a). In 50 out of 54 cases the repeated subformula of the propositional representation of U_2 was either (1) previously questioned, i.e. syntactically marked as focal (Prince, 1986), or (2) prosodically marked as focal in U_1. In other words, the repeated *Chestnut St.* of 1B was **focal** information in 1A.

Furthermore, the repeated focal information in Acceptance IRUs is prosodically marked as hearer-old information by the speaker's choice of both prosodic contour and phrase final tones (Prince, 1992; Walker, 1993b; Walker, 1993a).

Thus one key difference between Acceptance IRUs and Rejection IRUs is their information structure. Acceptance IRUs re-realize focal information from U_1 and

mark it as old information. Rejection IRUs re-realize the open proposition from U_1, and either omit the focal item or replace the focal item with a scalarly related item.

This suggests that the basis for inference of rejection includes the condition in 23:

(23) EXCLUSION OF FOCUS CONDITION:

If an utterance U_2 by a speaker B asserts an (alternate) instantiation of the salient open proposition contributed to the context by an assertion U_1 as uttered by a speaker A, and U_2 omits, or provides an alternate or more general instantiation of the focused element e_i of U_1, then U_2 REJECTS U_1.

It follows from the analysis of rejection by implicature that the focused elements e_i are precisely those that potentially license scalar implicatures. The condition is formulated as EXCLUSION rather than replacement because 20B functions as a rejection.

Applying the EXCLUSION OF FOCUS CONDITION to the examples thus far, we see that in 20A the focus is *for me*. B's excluding this focus in 20B leads to the construction of the conjunctive scale. The conjunctive scale provides the basis for the rejection implicature.

In 5A the focus is *a man* whereas in 5B, the focus is *something*. The scale of *a man, something* is made salient by the focus marking, and *something* is a more general instantiation of *a man*, which then licenses the rejection implicature.

In 14A and 16A the focus is the conjunction of *brilliant and imaginative*, whereas in 14B and 16B, the focus is only *imaginative*. The rejection implicature is licensed by identifying the scale of conjunctive assertions.

In all these cases B's assertion REJECTS A's assertion because it meets the EXCLUSION OF FOCUS CONDITION.

In contrast, 1B realizes the focal element e_i of 1A, failing to meet the EXCLUSION OF FOCUS CONDITION. Thus 1B accepts 1A, as we might have expected from the fact that it is logically consistent and realizes e_i as hearer-old information (Prince, 1992).

Furthermore, the EXCLUSION OF FOCUS CONDITION provides an explanation of **how** the speaker and hearer coordinate on which scales are salient, and thereby coordinate their mutual beliefs about which scalar implicatures have been licensed. The utterance expressions from which a scale is to be identified are both marked as focal in U_1 and U_2 (See also (Rubinoff, 1987)). Thus the focal structure of **both** U_1 and U_2 is critical, for defining the relevant scale $\mathcal{O}$, and for constraining when rejection IRUs are felicitous. This can be seen by considering the difference in foci of the naturally occurring 20A and an invented variation given here as 20'A:

(20') A: We bought me these pajamas in New Orleans.

In the original utterance, the focus was *for me*. In 20' the focus is most natural on *New Orleans*. B can reject 20A with 20B by excluding the focus, but B's utterance is infelicitous as a rejection of 20'A. This is precisely because the benefactor *for me* is not focal in 20'A. It is not plausible that the propositional representations from which scalar implicatures are calculated are different in 20A and 20A'. Thus the key factor is not simply that the propositional representation makes available a scale of conjunctive assertions, the scale must be identified from the focus/open proposition structure of U_1 and U_2. Felicitous rejections meet the EXCLUSION OF FOCUS CONDITION.

4 The Role of Fall-Rise in Rejection

Rejection IRUs are often realized with a Fall-Rise intonational contour, which marks a focus, and conveys additional meaning. This additional intonational meaning has been characterized as incomplete deliberation, uncertainty, focus within a set, a statement or answer with reservation, a polite softener of denial or rejection, (Ward and Hirschberg, 1985; Ladd, 1980; Horn, 1989) *inter alia*.

Ladd proposed that a fall-rise contour on the focused element signals a subset or hyponym relation: the focused element represents a proper subset or member of a contextually accessible set (Ladd, 1980; Horn, 1989). In addition, he proposes that Fall-Rise signals disagreement or at least amendment (Ladd, 1980), p 155, i.e. 24B disagrees with 24A, by marking *fool* with Fall-Rise, as indicated in 24B. In contrast, the simple fall in 25B signals acceptance by a continuation, i.e. conveys implicit acceptance.

(24) A: Harry's the biggest liar in town.

B: The biggest $_F$fool$_R$, maybe (.. but I think he means what he says)

(25) A: Harry's the biggest liar in town.

B: The biggest fool$_F$, maybe. (not only a liar but a fool)

However, Fall-Rise is not **necessary** because an utterance that meets the EXCLUSION OF FOCUS CONDITION can reject without Fall-Rise as in 26, even without the explicit amendation marker of *maybe*.

(26) A: Sue's house is on Chestnut St.

B: Some street$_F$.

Furthermore, the Fall-Rise on 27B, which fails to meet the EXCLUSION OF FOCUS CONDITION, is at best interpreted as a bit odd.

(27) A: Sue's house is on Chestnut St.

B: It's on $_F$Chestnut$_R$ St.

Thus Fall-Rise is neither necessary nor sufficient for indicating rejection. However, Fall-Rise can certainly help conversants disambiguate between rejection and continuation. Perhaps 26B is ambiguous between continuation and rejection without the fall-rise or a *maybe*. It is also plausible that Fall-Rise indicates polite softening (Horn, 1989), which presupposes a less preferred response (Brown and Levinson, 1987), and this presupposition disambiguates between rejection and continuation.

5 The Cancellability Diagnostic

One remaining issue is that implicatures only arise when they are consistent with the context, but 15 is not consistent with 16A. This illustrates the problem of coordinating acceptance between two speakers. It can not be that 16A is added to the common ground by virtue of being uttered alone, because 16B rejects this addition. Further 16B rejects this addition indirectly by an implicature, thus our description of conversational coordination must allow for this possibility.

This problem is handled by the account of inferring mutual acceptance in (Walker, 1993a), which was originally proposed in order to explain the differential effect on what is mutually accepted of all the ways of indicating acceptance discussed in section 1. On this account, each conversant maintains a representation of what has been mutually accepted so far in the conversation, along with endorsements on these mutually accepted propositions. The account is briefly sketched below.

As a dialogue proceeds, propositions realized by, inferrable from, or implicated by, assertions or proposals are added to each conversant's representation of the common ground with endorsements of various strengths. Endorsements are used to indicate the source of the proposition, whether it was inferrable or asserted, and whether the inference was an implicature or an entailment (Galliers, 1991). Endorsements contribute to the degree to which a belief is epistemically entrenched, i.e. endorsements provide a qualitative way of distinguishing between beliefs that are defeasible and those that a conversant would rarely change (Gardenfors, 1990).

The two weakest endorsement types are HYPOTHESIS and DEFAULT, where HYPOTHESIS is used to endorse assumptions that have no evidence supporting them at all, and DEFAULT is used for implicatures. The ordering on endorsements reflects the **relative** defeasibility of assumptions: an assumption endorsed as a HYPOTHESIS

can be defeated by DEFAULT. When two contradictory beliefs have the same level of endorsement, then the coherence of a larger subset of the whole belief set is used to choose between them.

Rejection can be indicated by an implicature because implicatures are endorsed as DEFAULT, and the acceptance of A's assertion is endorsed as a HYPOTHESIS until after B has the opportunity to reject, *pace* (Perrault, 1990; Thomason, 1990). In other words, the mutuality of the content of A's assertion is only a hypothesis until after B's turn. If B's utterance implicates the negation of the proposition realized by A's assertion, then A's assertion is not added to the common ground.

Note that this process applies in turn to B's utterance, so that B's assertion (which implicates rejection) is added to the common ground, endorsed as a hypothesis, until after A's turn. In the case of rejection by implicature, B's utterance is only weakly rejecting, or amending, because B's utterance asserts a weaker version of A's utterance, and B's utterance is added to the common ground, unless it is rejected by A in A's next turn. Thus what is mutually accepted evolves over time, with acceptance inferred weakly until more evidence is provided, allowing a rejection implicature to defeat the hypothesis of acceptance.

6 Conclusion

In sum, rejection need not be conveyed by denial or contradiction; a logically consistent U_2 REJECTS U_1 by a quantity implicature. The analysis is easily extensible to other types of illocutionary acts such as proposals, and highlights a more general class of Scalar Rejections. For example, it is possible to reject with an ALTERNATE scalar item as in 28B:

(28) A: Let's buy some bananas.

B: Let's buy some oranges.

It is also possible to reject with a HIGHER scalar item as in 29B (Horn, 1989):

(29) A: Vinnie likes Chuck.

B: She loves him.

Furthermore rejection implicatures are dependent on the FOCUS/OPEN PROPOSITION STRUCTURE of **both** U_1 and U_2. Thus it is critical that information structure be represented and used by a formal account of context incrementation and not simply logical form (Vallduvi, 1992; Moser, 1992). Finally, to avoid conflicting defaults, acceptance must be treated as a hypothesis until after B has an opportunity to reject A's assertion (Walker, 1993a).

7 Acknowledgements

I am indebted to Megan Moser for discussion and for originally suggesting that example 5 might be a type of scalar implicature, and to Beatrice Santorini, Craige Roberts, Masayo Iida, Beth Ann Hockey, Ellen Prince, Rich Thomason and Larry Horn for discussing the ideas in this paper.

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